
Pluripotent Stem Cell-Based Organoid Technologies for Developing Next-Generation Vision Restoration Therapies of Blindness.

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Funding Grants: Restoring vision by sheet transplants of retinal progenitors and retinal pigment epithelium (RPE) derived from human embryonic stem cells (hESCs), Morphological and functional integration of stem cell derived retina organoid sheets into degenerating retina models

Public Summary:

Blindness, associated with death of retinal cells at the back of the eye, is caused by a number of conditions; most frequently occurring are glaucoma, age-related macular degeneration, and diabetic retinopathy. In addition, a large number of inherited conditions, such as retinitis pigmentosa and Leber Congenital Amaurosis, add to the overall number of patients with blinding retinal degenerative diseases. Blindness caused by deterioration and loss of retina is so far incurable. Modern biomedical research leveraging molecular and regenerative medicine approaches had a number of groundbreaking discoveries and proof-of-principle treatments of blindness in animals. However, these methods are slow to be standardized and commercialized as therapies to benefit people losing their eyesight due to retinal degenerative conditions. In this review, we will outline major regenerative medicine approaches, which are emerging as promising for preserving or/and restoring vision. We discuss the potential of each of these approaches to reach commercialization step and be converted to treatments, which could at least ameliorate blindness caused by retinal cell death.

Scientific Abstract:

Blindness, associated with death of retinal cells at the back of the eye, is caused by a number of conditions with high prevalence such as glaucoma, age-related macular degeneration, and diabetic retinopathy. In addition, a large number of orphan inherited (mostly monogenic) conditions, such as retinitis pigmentosa and Leber Congenital Amaurosis, add to the overall number of patients with blinding retinal degenerative diseases. Blindness caused by deterioration and loss of retina is so far incurable. Modern biomedical research leveraging molecular and regenerative medicine approaches had a number of groundbreaking discoveries and proof-of-principle treatments of blindness in animals. However, these methods are slow to be standardized and commercialized as therapies to benefit people losing their eyesight due to retinal degenerative conditions. In this review, we will outline major regenerative medicine approaches, which are emerging as promising for preserving or/and restoring vision. We discuss the potential of each of these approaches to reach commercialization step and be converted to treatments, which could at least ameliorate blindness caused by retinal cell death.

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